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Matsumoto

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(54) **ELECTRONIC DEVICE AND INFORMATION PROCESSING METHOD FOR GENERATING INFORMATION CORRESPONDING TO AN OPERATION IN RESPONSE TO INPUT OF PREDETERMINED TRIGGER OPERATION IN CONJUNCTION WITH THE OPERATION**

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G06F 3/046	(2006.01)
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(52) **U.S. Cl.**

CPC ***G06F 3/04897*** (2013.01); ***G06F 9/453*** (2018.02)

(58) **Field of Classification Search**

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See application file for complete search history.

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Primary Examiner — Shourjo Dasgupta

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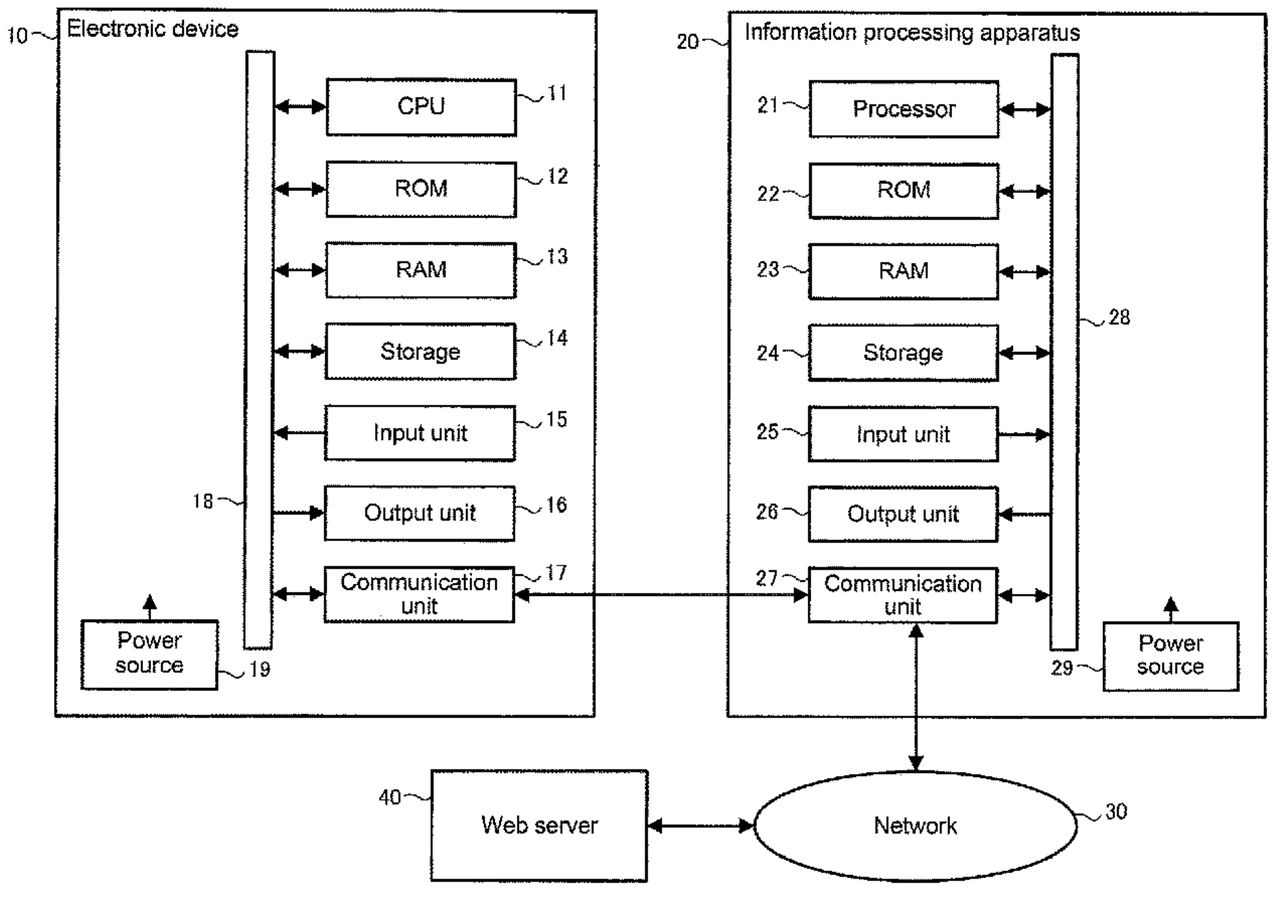
(57) **ABSTRACT**

An electronic device includes an input device configured to receive an operation, and a processor which performs a function according to the operation input via the input device. The processor is configured to: in response to an input of a first operation indicative of a function to perform via the input device, perform the function specified based on the first operation; and in response to an input of a predetermined trigger operation via the input device in conjunction with the first operation, generate first information corresponding to the first operation.

16 Claims, 7 Drawing Sheets



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Notice of Reasons for Refusal dated Aug. 10, 2021 received in Japanese Patent Application No. JP 2019-051201 together with an English language translation.

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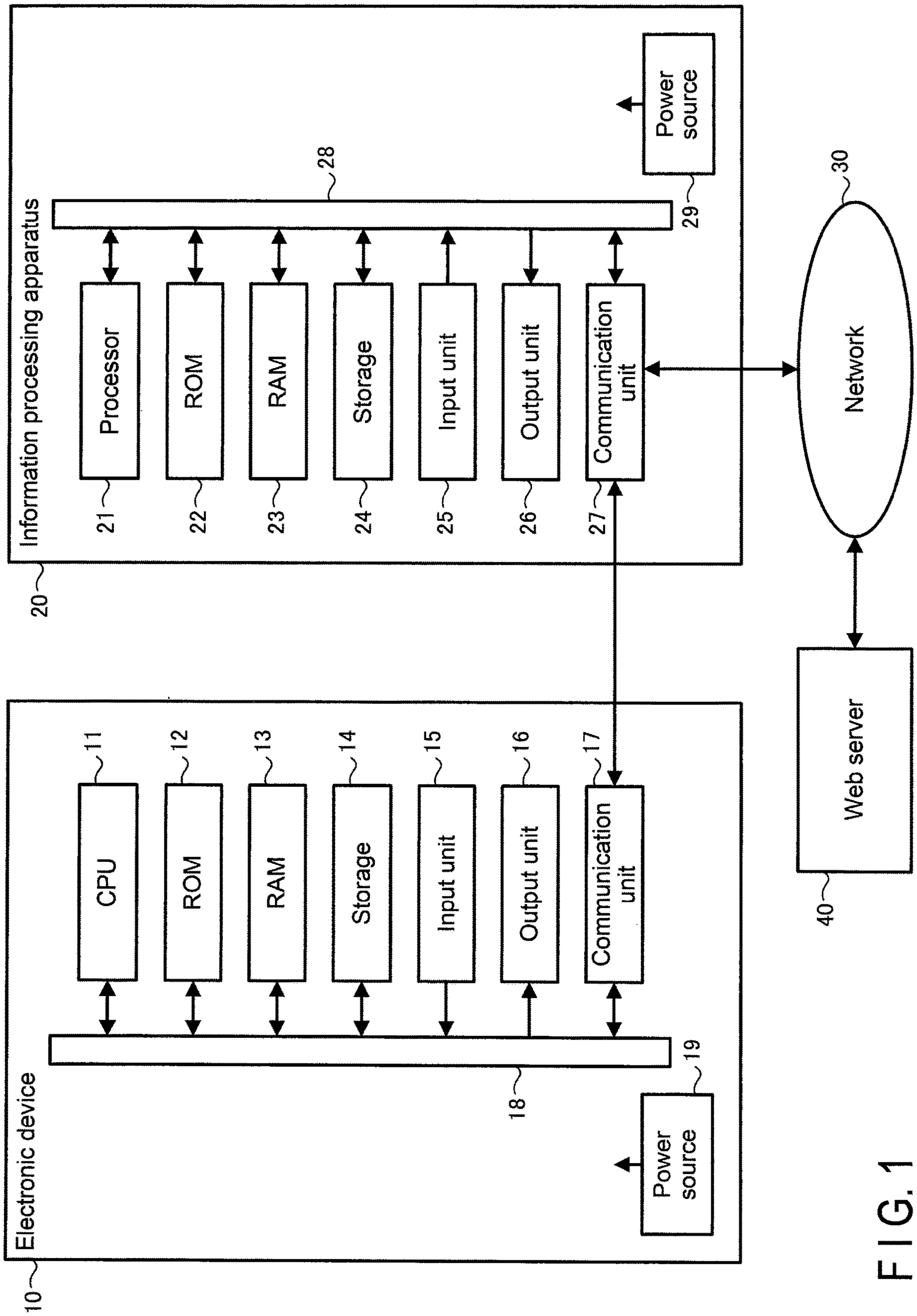

Electronic device
10
CPU
11
ROM
12
RAM
13
Storage
14
Input unit
15
Output unit
16
Communication unit
17
18
Power source
19
Information processing apparatus
20
Processor
21
ROM
22
RAM
23
Storage
24
Input unit
25
Output unit
26
Communication unit
27
28
Power source
29
30
Network
Web server
40

FIG. 1

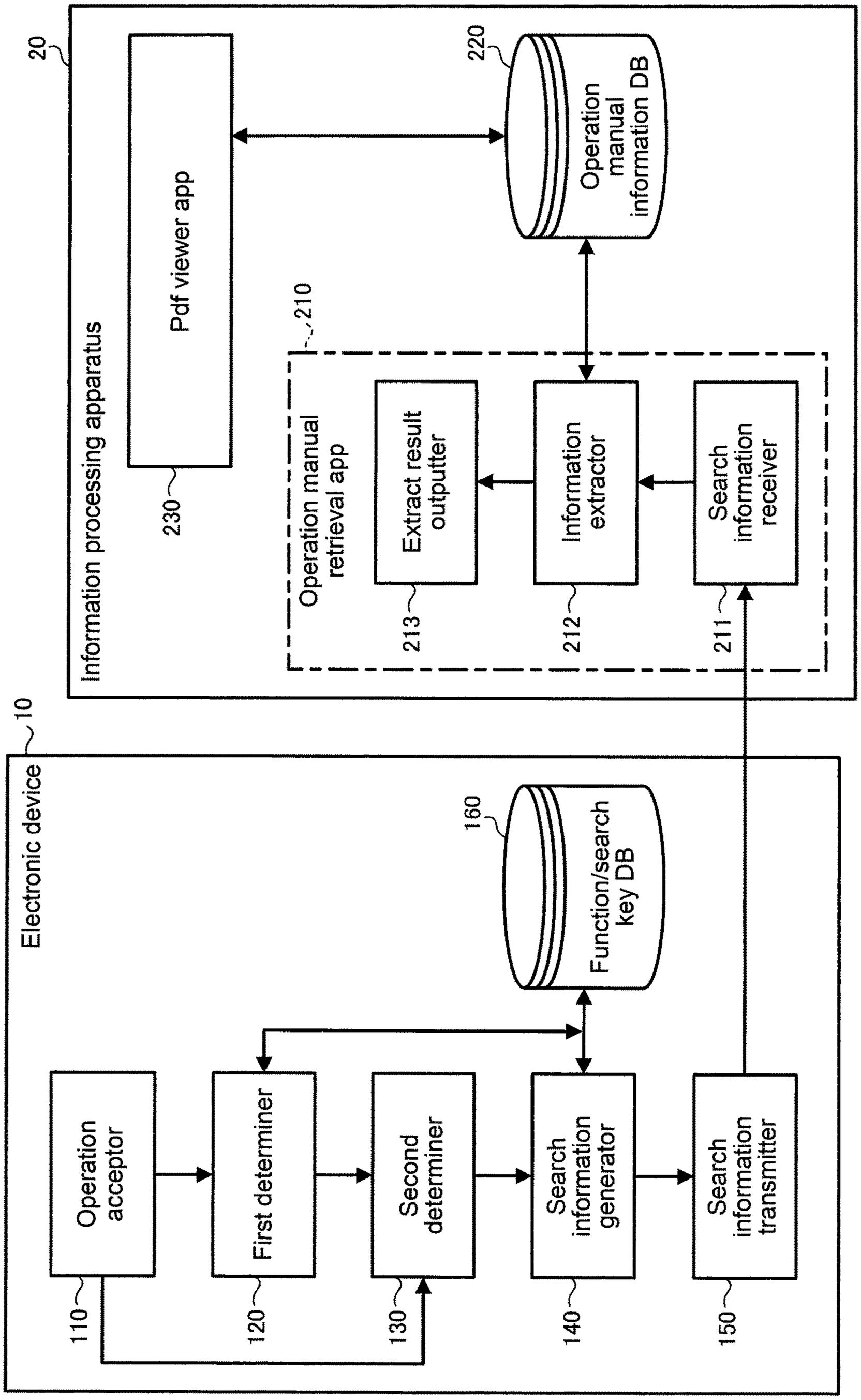

Electronic device
10
Operation acceptor
110
First determiner
120
Second determiner
130
Search information generator
140
Search information transmitter
150
Function/search key DB
160
Information processing apparatus
20
Pdf viewer app
230
Operation manual retrieval app
210
Extract result outputter
213
Information extractor
212
Search information receiver
211
Operation manual information DB
220

FIG. 2

Operation Contents		Functions	Display Contents	Trigger Actions (First, Second)		Search Key (Text) Information
				First Action	Second Action	
Hard Keys		Display given character string on screen (input area)	log[ ]	Hold down log	Tilt electronic device (calculator) forward with log pressed down	log
	SHIFT		10^[ ]			10^x
	ALPHA		B			B
Soft Keys			log[ ]	Flick down log	Tilt electronic device (calculator) forward with log pressed down (with flick)	log
	SHIFT		10^[ ]			10^x
	ALPHA		B			B
Mic			log[ ]	Say 'log' in high tone	Tilt electronic device (calculator) forward with 'log' utterance	log
	shift (utterance)		10^[ ]			10^x
	alpha (utterance)		B			B

FIG. 3

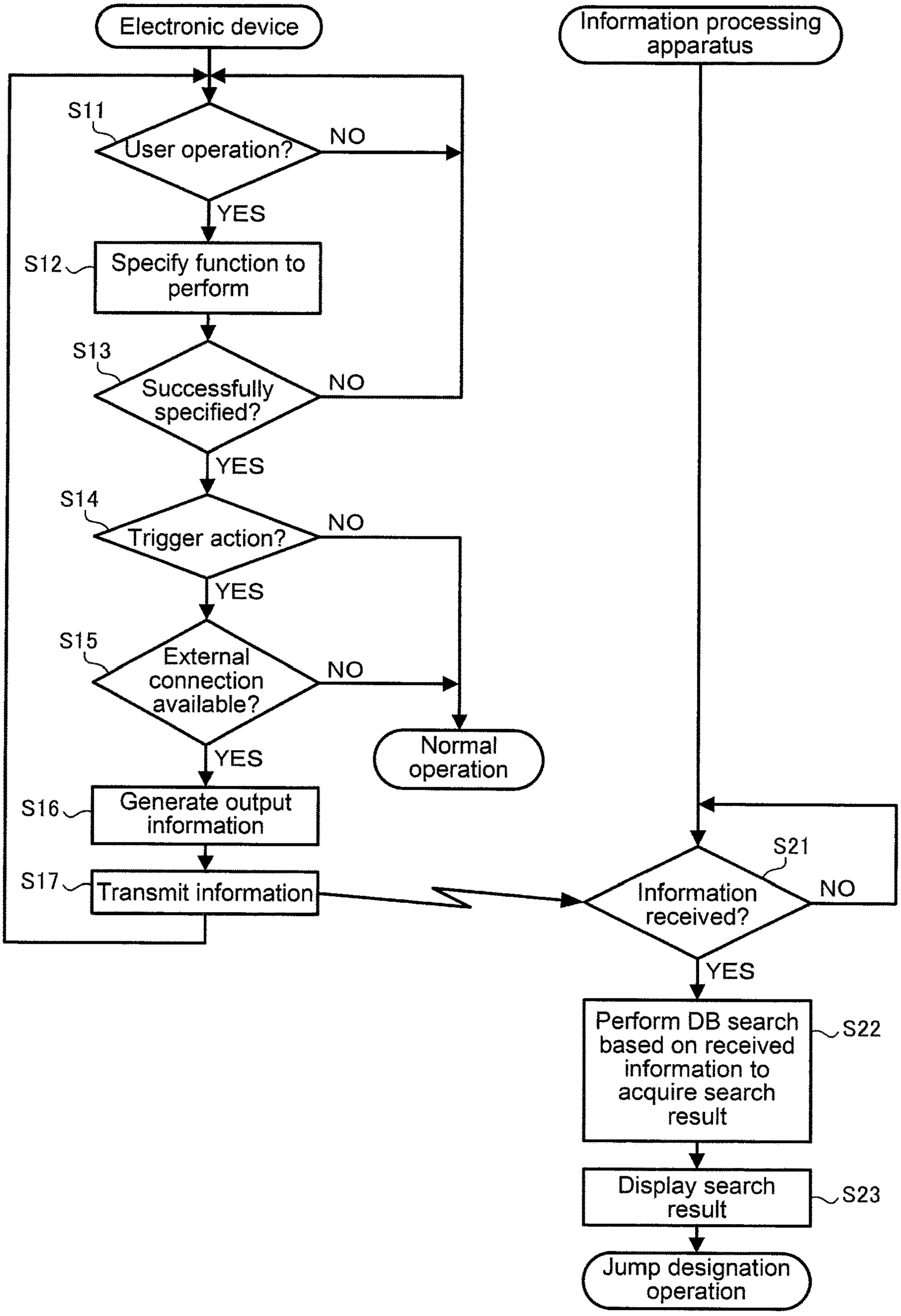

Electronic device
S11
User operation?
NO
YES
S12
Specify function to perform
S13
Successfully specified?
NO
YES
S14
Trigger action?
NO
YES
S15
External connection available?
NO
YES
Normal operation
S16
Generate output information
S17
Transmit information
Information processing apparatus
S21
Information received?
NO
YES
Perform DB search based on received information to acquire search result
S22
Display search result
S23
Jump designation operation

FIG. 4

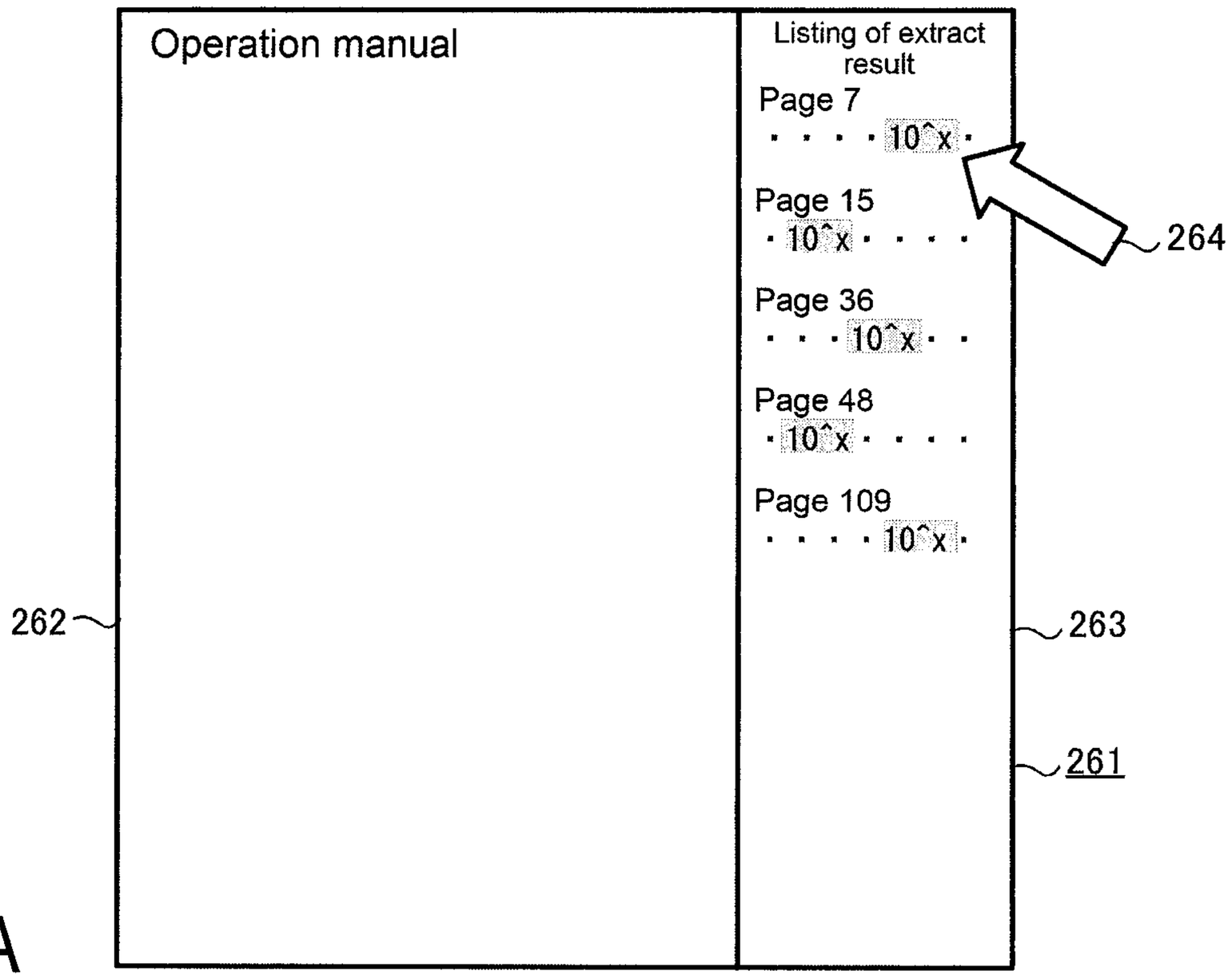
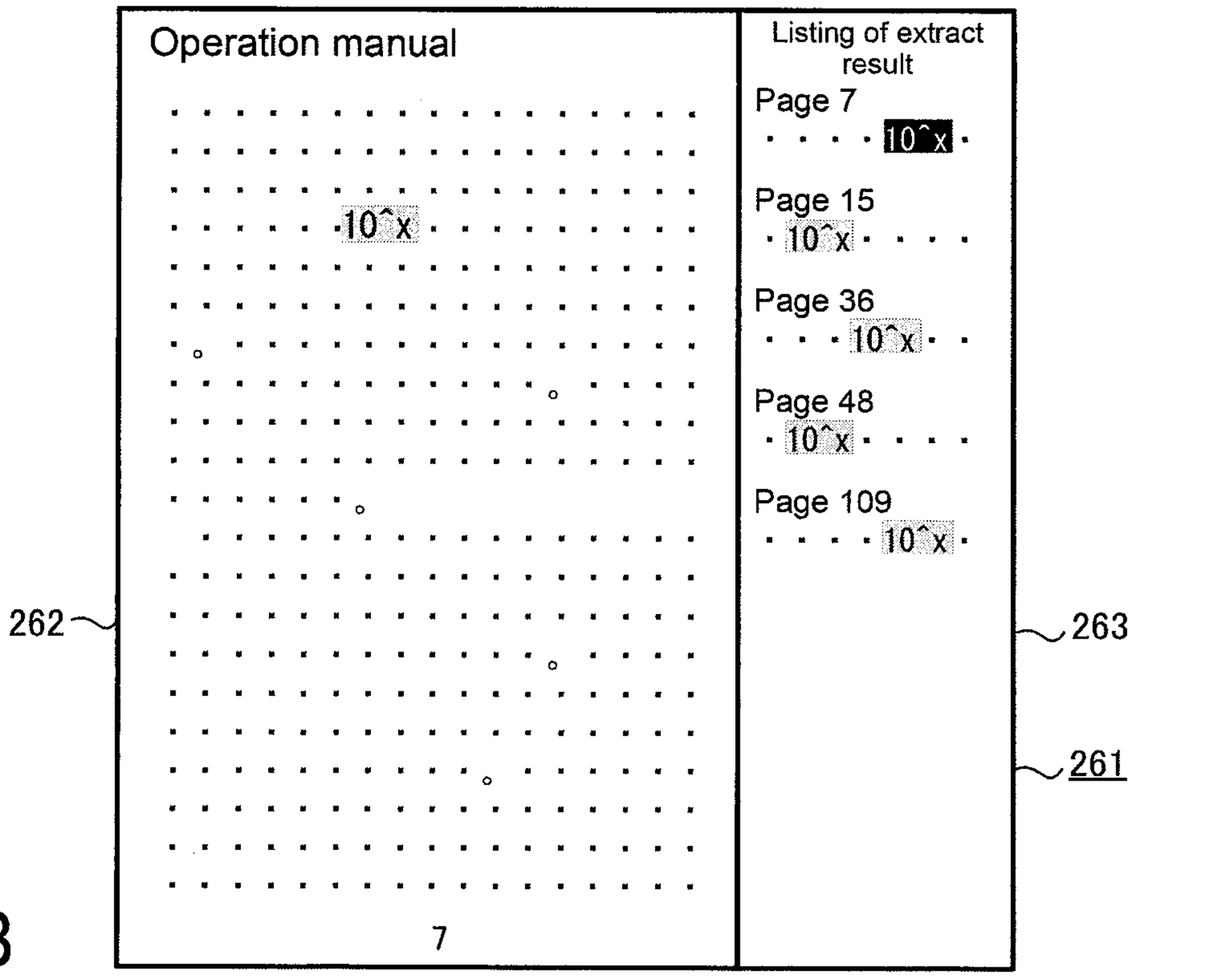

Operation manual
Listing of extract result
Page 7
· · · · 10^x ·
Page 15
· 10^x · · · ·
Page 36
· · · 10^x · ·
Page 48
· 10^x · · · ·
Page 109
· · · · 10^x ·
262
263
261
264

FIG. 5A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10^x
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Page 7
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Page 48
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Page 109
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261
7

FIG. 5B

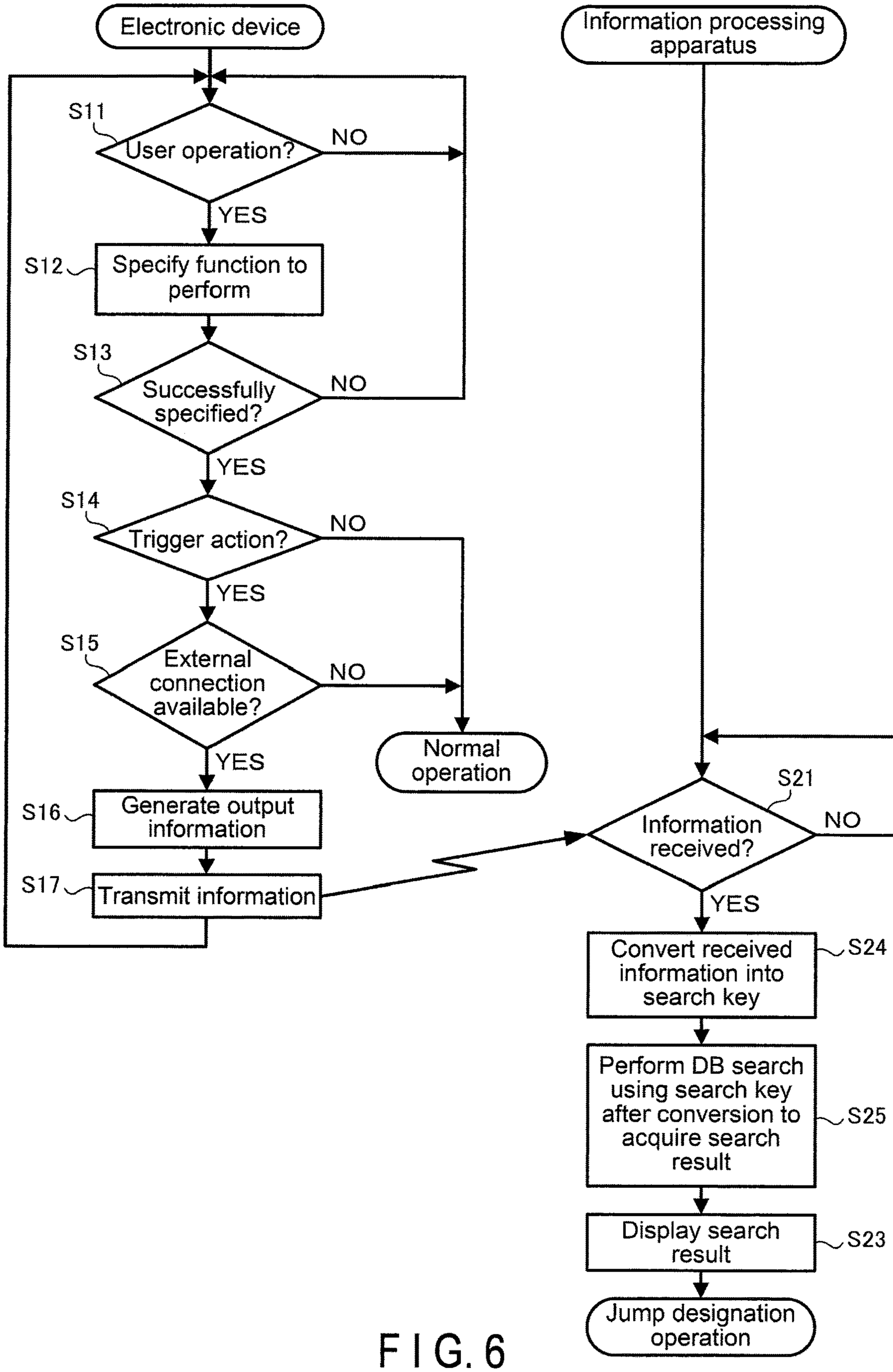
Electronic device
S11
User operation?
NO
YES
S12
Specify function to perform
S13
Successfully specified?
NO
YES
S14
Trigger action?
NO
YES
S15
External connection available?
NO
YES
Normal operation
S16
Generate output information
S17
Transmit information
Information processing apparatus
S21
Information received?
NO
YES
Convert received information into search key
S24
Perform DB search using search key after conversion to acquire search result
S25
Display search result
S23
Jump designation operation

FIG. 6

Operation Contents	Functions	Trigger Actions (First, Second)		Specifying Information
		First Action	Second Action	
Hard Keys	Display given character string on screen (input area)	Hold down log	Tilt electronic device (calculator) forward with log pressed down	P7L4C6–8, P15L21C2–4, P15I2, P36L3C4–6, P48L11C2–4, P109L16C7–9, P207I1, P207I3, . . .
log	log[ ]	. . .	. . .	. . .
. . .	. . .	. . .	. . .	. . .
. . .	. . .	. . .	. . .	. . .

FIG. 7

ELECTRONIC DEVICE AND INFORMATION PROCESSING METHOD FOR GENERATING INFORMATION CORRESPONDING TO AN OPERATION IN RESPONSE TO INPUT OF PREDETERMINED TRIGGER OPERATION IN CONJUNCTION WITH THE OPERATION

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based upon and claims the benefit of priority from prior Japanese Patent Application No. 2019-051201, filed Mar. 19, 2019, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The disclosure herein relates to an electronic device and an information processing method.

2. Description of the Related Art

Jpn. Pat. Appln. KOKAI Publication No. 2002-123349 discloses a system, in which a camera as an electronic device and a personal computer as an information processing apparatus are communicably connected to each other. When the electronic device is set in a help display mode, and then subjected to a key operation, information about the operated key is sent to the information processing apparatus, and the information processing apparatus displays help information for this key on its screen.

SUMMARY

According to an aspect of the disclosure, an electronic device includes an input device configured to receive an operation, and a processor which performs a function according to the operation input via the input device. The processor is configured to: in response to an input of a first operation indicative of a function to perform via the input device, perform the function specified based on the first operation; and in response to an input of a predetermined trigger operation via the input device in conjunction with the first operation, generate first information corresponding to the first operation.

According to another aspect of the disclosure, a method is implemented in an electronic device which includes an input device configured to receive an operation and a processor configured to perform a function according to the operation input via the input device. The method includes: in response to an input of a first operation indicative of a function to perform via the input device, performing, by the processor, the function specified based on the first operation; and in response to an input of a predetermined trigger operation via the input device in conjunction with the first operation, generating, by the processor, first information corresponding to the first operation.

According to yet another aspect of the disclosure, a method is implemented in an information outputting system which includes an electronic device and an information processing apparatus configured to communicate with the electronic device. The electronic device includes an input device configured to receive an operation and a processor configured to perform a function according to the operation input via the input device. The method includes: in response to an input of a first operation indicative of a function to perform via the input device, performing, by the processor of the electronic device, the function specified based on the first operation; in response to an input of a predetermined trigger operation via the input device in conjunction with the first operation, generating and outputting, by the processor of the electronic device, first information corresponding to the first operation so that the first information is received by the information processing apparatus; acquiring, by the information processing apparatus, the first information; extracting, by the information processing apparatus and based on second information corresponding to the first information, an information portion corresponding to the second information from information about the electronic device, stored in a memory of the information processing apparatus or acquired via a network; and outputting, by the information processing apparatus, information indicative of the information portion corresponding to the second information.

Advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. Advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the invention, and together with the general description given above and the detailed description of the embodiments given below, serve to explain the principles of the invention.

FIG. **1** is a block diagram schematically showing exemplary architecture of an information outputting system according to one embodiment of the present disclosure.

FIG. **2** is a block diagram schematically showing an exemplary functional configuration of the information outputting system.

FIG. **3** is a diagram schematically showing an exemplary storage configuration of a function/search key DB appearing in FIG. **2**.

FIG. **4** is a flowchart schematically showing an exemplary operation of the information outputting system.

FIG. **5**A is a diagram showing an example of an output of a search result.

FIG. **5**B is a diagram showing an example of an output when a select action is performed on the search result.

FIG. **6** is a flowchart schematically showing an exemplary operation of an information outputting system according to a modification of one embodiment.

FIG. **7** is a diagram schematically showing an exemplary storage configuration of a function/search key DB in an information outputting system according to another embodiment of the present disclosure.

DETAILED DESCRIPTION

Certain embodiments of the present disclosure will be described with reference to the drawings.

FIG. **1** is a diagram showing exemplary architecture of an information outputting system according to one embodiment of the present disclosure. The information outputting system includes an electronic device **10** and an information processing apparatus **20**. The electronic device **10** and the information processing apparatus **20** are communicably con-

nected to each other by wire or in a wireless manner. The electronic device **10** is a device with multiple keys, and by way of non-limiting example, the embodiment will assume the electronic device **10** to be a scientific electronic calculator. The information processing apparatus **20** may be any apparatus such as, for example, a personal computer (PC), a tablet PC, a smartphone, or an electronic book, as long as it has a function of allowing information viewing. Note that the information processing apparatus **20** is adapted to communicate with a web server **40** via a network **30**. The network **30** is, for example, the Internet. The web server **40** offers, for example, a variety of application programs (which may be simply called "app" or "apps") for the information processing apparatus **20** to execute. The web server **40** may be a server run by the manufacturer or the like of the electronic device **10**, and provides an electronic manual (operation manual) of the electronic device **10**. As such, the information processing apparatus **20** can download the operation manual of the electronic device **10** from the web server **40** via the network **30**, and present it for viewing.

The electronic device **10** includes a central processing unit (CPU) **11**, a ROM **12**, a RAM **13**, a storage **14**, an input unit **15**, an output unit **16**, and a communication unit **17**. These components are connected to one another via a system bus **18**, and each adapted to operate on a supply of power from a power source **19**.

The CPU **11** is a processor for controlling the electronic device **10** for various operations. The ROM **12** stores a boot program, etc. The RAM **13** functions as a main storage unit for the CPU **11**. The storage **14** stores various programs, parameters, etc., the programs including control programs for use by the CPU **11** and arithmetic programs for conducting various operations. The storage **14** may be a non-volatile memory such as a flash memory. These programs such as control programs, parameters, etc., may instead be stored in the ROM **12** so that the storage **14** is omitted. The CPU **11** controls operations of the electronic device **10** by executing the programs according to input signals from the input unit **15**, or receive signals via the communication unit **17**.

The input unit **15** may include any given number of hard keys, as well as a touch panel (with soft keys) arranged on a screen of a liquid-crystal display, i.e., the output unit **16**. The input unit **15** may also include a voice input part such as a microphone (which may be simply called "mic"), a sensor for detecting the posture of the electronic device **10** such as an acceleration sensor, and so on. With this input unit **15** operated, input signals are provided to the CPU **11** via an input interface (not illustrated) and then the system bus **18**.

The output unit **16** includes a liquid-crystal display, a speaker, etc. The output unit **16** may also include a vibrator for generating vibrations. The output unit **16** receives output signals transmitted from the CPU **11** via the system bus **18** and then an output interface (not illustrated).

The communication unit **17** includes, for example, one or more wired or wireless communication interface units to enable transmission and reception of various information sets with external devices including the information processing apparatus **20**. The wired interface may adopt, for example, a universal serial bus (USB), etc., and the wireless interface may adopt, for example, a wireless LAN, a low-power wireless data communication standard such as Bluetooth (registered trademark), etc.

The information processing apparatus **20** includes a processor **21**, a ROM **22**, a RAM **23**, a storage **24**, an input unit **25**, an output unit **26**, and a communication unit **27**. These components are connected to one another via a system bus **28**, and each adapted to operate on a supply of power from a power source **29**.

The processor **21** may be an integrated circuit such as a CPU. The ROM **22** stores information used for operations of the processor **21**. The RAM **23** functions as a main storage unit for the processor **21**. The storage **24** stores control programs, various apps, parameters, etc., for use by the processor **21**. These apps may be downloaded to the storage **24** from the web server **40** via the network **30** and the communication unit **27**. The processor **21** controls the information processing apparatus **20** to operate according to the programs stored in the storage **24**. The processor **21** may be other than a CPU, and the examples of the processor **21** include an application specific integrated circuit (ASIC), a field programmable gate array (FPGA), etc.

The input unit **25** may include a keyboard and a mouse, as well as a touch panel arranged on a screen of a liquid-crystal display, i.e., the output unit **26**. The input unit **25** may also include input means for multimedia information, such as a microphone, camera, etc. With the input unit **25** operated, input signals are provided to the processor **21** via an input interface (not illustrated) and then the system bus **28**.

The output unit **26** may include an external display device adopting a liquid-crystal display, etc., or a display component of the information processing apparatus **20** which may also adopt a liquid-crystal display, etc. The output unit **26** receives output signals transmitted from the processor **21** via the system bus **28** and then an output interface (not illustrated).

The communication unit **27** includes, for example, one or more wired or wireless communication interface units to enable communication with external devices including the electronic device **10** and communication with external communication networks including the network **30**. The wired interface may adopt, for example, a wired LAN, a USB, etc., and the wireless interface may adopt, for example, a wireless LAN, a low-power wireless data communication standard such as Bluetooth (registered trademark), etc.

FIG. **2** is a block diagram schematically showing an exemplary functional configuration of the information outputting system with the above architecture.

The CPU **11** of the electronic device **10** executes the control programs stored in the storage **14** (or the ROM **12**) so that it can function as an operation acceptor **110**, a first determiner **120**, a second determiner **130**, a search information generator **140**, and a search information transmitter **150**.

The operation acceptor **110** accepts user operations via the input unit **25**.

The first determiner **120**, in response to the operation acceptor **110** having accepted an operation (first operation) from a user, refers to a function/search key database (DB) **160** stored in the storage **14** (or the ROM **12**) to specify a function to perform according to the contents of the accepted user operation.

The second determiner **130**, in response to the operation acceptor **110** having accepted the first operation from the user, determines whether or not the operation acceptor **110** has also accepted a predetermined trigger action in conjunction with this user operation. If it is determined that the predetermined trigger action has not been accepted, the second determiner **130** passes the information about the function to perform, specified by the first determiner **120**, to a corresponding executing part (not illustrated) so that the function will be performed by this part. If, on the other hand, it is determined that the predetermined trigger action has

been accepted, the second determiner **130** informs the search information generator **140** of the first operation and the trigger action accepted by the operation acceptor **110**.

The search information generator **140**, in response to the second determiner **130** having determined that the operation acceptor **110** has accepted the trigger action, refers to the function/search key DB **160** to generate information (first information) corresponding to the user operation accepted by the operation acceptor **110**.

The search information transmitter **150** transmits this information generated by the search information generator **140** and corresponding to the user operation, namely, search information, to the information processing apparatus **20** through the communication unit **17**.

The function/search key DB **160** stores information about the function referred to by the first determiner **120** and performed by the CPU **11** according to the respective first operation, and the first information referred to by the second determiner **130** and corresponding to the respective first operation. The first information may be any of information specifying the first operation, information specifying a function, or information corresponding to a function.

FIG. **3** is a diagram schematically showing an exemplary storage configuration of the function/search key DB **160**. The figure shows, as a typical example, the case with a [[log]] key which is one of many keys constituting the input unit **15**. The description will assume instances where the first information is information corresponding to a function, and in particular, the first information is in the form of text data for use as a search key in text searches. Note that use of a double bracket pair ([[. . .]]) herein indicates that the term or symbol inserted therein is assigned a single key.

The function/search key DB **160** is adapted to retain records for hard keys, records for soft keys implemented with the liquid-crystal display and the touch panel, and records for microphone-input voices obtained through voice recognition, but it is not a requisite for the function/search key DB **160** to have all of such records. As items in each record, the function/search key DB **160** stores corresponding operation contents, function, display contents, trigger action, and search key (text) information. Each trigger action includes a first action and/or a second action.

The function/search key DB **160** retains the records in association with respective cases. For example, the records for a hard key [[log]] include a record associated with the case of the [[log]] key solely operated, a record associated with the case of the [[log]] key operated in combination with a [[SHIFT]] key (that is, the case where it is operated subsequently to or concurrently with the [[SHIFT]] key), and a record associated with the case of the [[log]] key operated in combination with an [[ALPHA]] key (that is, the case where it is operated subsequently to or concurrently with the [[ALPHA]] key).

For the record associated with the case of the sole [[log]] key operation, the function/search key DB **160** stores "log" as the operation contents, "display given character string on screen (input area)" as the function, "log[ ]" as the display contents, "hold down log" as the first trigger action, "tilt electronic device (calculator) forward with log pressed down" as the second trigger action, and text data "log" as the search key (text) information. For the record associated with the case of the combined [[SHIFT]] key and [[log]] key operation, the function/search key DB **160** stores "SHIFT" and "log" as the operation contents, "display given character string on screen (input area)" as the function, "10^[ ]" as the display contents, "hold down log" as the first trigger action, "tilt electronic device (calculator) forward with log pressed down" as the second trigger action, and text data "10^x" as the search key (text) information. For the record associated with the case of the combined [[ALPHA]] key and [[log]] key operation, the function/search key DB **160** stores "ALPHA" and "log" as the operation contents, "display given character string on screen (input area)" as the function, "B" as the display contents, "hold down log" as the first trigger action, "tilt electronic device (calculator) forward with log pressed down" as the second trigger action, and text data "B" as the search key (text) information. Here, the tilt of the electronic device **10** as the second trigger action can be detected by the acceleration sensor in the input unit **15**.

In the function/search key DB **160** of this example, the records for a soft key [[log]] include, similar to the storage configuration for the hard key, a record associated with the case of the [[log]] key solely operated, a record associated with the case of the [[log]] key operated in combination with a [[SHIFT]] key (that is, the case where it is operated subsequently to or concurrently with the [[SHIFT]] key), and a record associated with the case of the [[log]] key operated in combination with an [[ALPHA]] key (that is, the case where it is operated subsequently to or concurrently with the [[ALPHA]] key). Items in each record for the soft key is the same as the respective items for the hard key, except the trigger action. For each record, the function/search key DB **160** stores "flick down log" as the first trigger action, and "tilt electronic device (calculator) forward with log pressed down (with flick)" as the second trigger action.

In the function/search key DB **160**, the records for microphone-input voices obtained through voice recognition include a record associated with the case of an utterance "log" solely input, a record associated with the case of the utterance "log" input in combination with an utterance "shift" (that is, the case where the utterance "log" is made subsequently to the utterance "shift"), and a record associated with the case of the utterance "log" input in combination with an utterance "alpha" (that is, the case where the utterance "log" is made subsequently to the utterance "alpha").

For the record associated with the case of the sole "log" utterance input, the function/search key DB **160** stores "log (utterance)" as the operation contents, "display given character string on screen (input area)" as the function, "log[ ]" as the display contents, "say 'log' in high tone" as the first trigger action, "tilt electronic device (calculator) forward with 'log' utterance" as the second trigger action, and text data "log" as the search key (text) information. For the record associated with the case of the combined "shift" utterance and "log" utterance input, the function/search key DB **160** stores "shift (utterance)" and "log (utterance)" as the operation contents, "display given character string on screen (input area)" as the function, "10^[ ]" as the display contents, "say 'log' in high tone" as the first trigger action, "tilt electronic device (calculator) forward with 'log' utterance" as the second trigger action, and text data "10^x" as the search key (text) information. For the record associated with the case of the combined "alpha" utterance and "log" utterance input, the function/search key DB **160** stores "alpha (utterance)" and "log (utterance)" as the operation contents, "display given character string on screen (input area)" as the function, "B" as the display contents, "say 'log' in high tone" as the first trigger action, "tilt electronic device (calculator) forward with 'log' utterance" as the second trigger action, and text data "B" as the search key (text) information.

The processor **21** of the information processing apparatus **20** runs the apps stored in the storage **24** so that it can

provide various functions. One of such apps is an operation manual retrieval app **210**, and the processor **21**, by running this app, can function as a search information receiver **211**, an information extractor **212**, and an extract result outputter **213**. The operation manual retrieval app **210** may be downloaded by the communication unit **27** from the web server **40** via the network **30**, and stored in the storage **24**.

The search information receiver **211** receives information (first information) corresponding to a user operation, e.g., the search key (text) information, from the electronic device **10** through the communication unit **27**.

The information extractor **212** searches an operation manual information DB **220** stored in the storage **24** using, as a search key, information (second information) corresponding to the first information received by the search information receiver **211**, and extracts a portion corresponding to the second information from operation manual information contained in the operation manual information DB **220**.

Note that the operation manual information DB **220** retains electronic data of the operation manual of the electronic device **10**, which may be, for example, a pdf-format electronic manual. Similar to the operation manual retrieval app **210** for example, this operation manual information DB **220** may be downloaded by the communication unit **27** from the web server **40** via the network **30** and stored in the storage **24**.

The extract result outputter **213** causes the output unit **26**, which may be a liquid-crystal display, to present a display of the portion of the operation manual information that has been extracted by the information extractor **212** and that corresponds to the second information.

The second information corresponding to the first information (information transmitted from the electronic device **10** and corresponding to a user operation) here may be the same as the first information. That is, if the first information is text data (e.g., text "10^x") corresponding to a function as discussed, this first information can be employed as a search key in text searches as it is.

The information processing apparatus **20** may be provided with a pdf viewer app **230** for viewing pdf-format electronic manuals, i.e., electronic data of operation manuals stored in the operation manual information DB **220**.

Now, as one example, the description will be given of how the information outputting system with the above configuration operates. FIG. **4** is a flowchart schematically showing an exemplary operation of this information outputting system.

In the electronic device **10**, the CPU **11** as the operation acceptor **110** stands by for a user operation (first operation) to be accepted through the hard keys, the soft keys, or the microphone (step S**11**). In response to the operation acceptor **110** accepting the first operation, the CPU **11** as the first determiner **120** refers to the function/search key DB **160** and specifies the function to perform according to the contents of the accepted user operation (step S**12**). The CPU **11** as the first determiner **120** determines whether or not the function to perform has been successfully specified (step S**13**). For example, the function cannot be specified based on the operation of the hard key [[SHIFT]] alone, until a given subsequent operation is done. If it is determined that the function has not been specified, the CPU **11** returns the processing to step S**11**.

In the event that the operation acceptor **110** accepts an operation of, for example, the hard key [[log]] subsequently to the operation of the hard key [[SHIFT]], the CPU **11** can specify in step S**12** that the function to perform is displaying "10^[ ]" on the screen (input area) of the liquid-crystal display as the output unit **16**.

If it is determined that the function has been specified, the CPU **11** as the second determiner **130** determines whether or not the operation acceptor **110** has accepted a predetermined trigger action (first action or second action) in conjunction with the user operation (step S**14**). If it is determined that the predetermined trigger action has not been accepted, the CPU **11** as the second determiner **130** sends the information about the function to perform, specified by the first determiner **120**, to a corresponding executing part (not illustrated) so that the function, e.g., displaying "10^[ ]" on the display screen (input area), will be performed by this part.

If, on the other hand, it is determined that the predetermined trigger action, e.g., holding down the [[log]] key, has been accepted, the CPU **11** as the second determiner **130** determines whether or not a connection to the information processing apparatus **20** is established via the communication unit **17** (step S**15**). If it is determined that the connection to the information processing apparatus **20** is not established, the CPU **11** as the second determiner **130** sends the information about the function to perform, specified by the first determiner **120**, to the corresponding executing part (not illustrated) so that the function will be performed by the part.

If it is determined that the connection to the information processing apparatus **20** is established, the CPU **11** as the second determiner **130** informs the search information generator **140** of the first operation and the trigger action accepted by the operation acceptor **110**, so that the search information generator **140** is caused to generate output information (step S**16**). For example, in the event that the hard keys [[SHIFT]] and [[log]] have been operated and further the [[log]] key has been held down, the search information generator **140** acquires text data "10^x" from the function/search key DB **160**, and uses this text data as the output information indicative of the information (first information) corresponding to the user operation accepted by the operation acceptor **110**.

Then, the CPU **11** as the search information transmitter **150** transmits this output information to the information processing apparatus **20** (step S**17**), and the CPU **11** returns the processing to step S**11**.

Meanwhile, in the information processing apparatus **20** where the processor **21** has launched the operation manual retrieval app **210**, the processor **21** as the search information receiver **211** stands by for the output information to be received from the electronic device **10** (step S**21**).

In response to the search information receiver **211** receiving the output information from the electronic device **10**, the processor **21** as the information extractor **212** searches the operation manual information DB **220** based on the output information received by the search information receiver **211** to acquire a search result (step S**22**). For example, if the search information receiver **211** receives text data "10^x", then the pdf-format electronic manual stored in the operation manual information DB **220** is searched for with this text data.

The processor **21** as the extract result outputter **213** causes the liquid-crystal display, i.e., the output unit **26**, to display the search result (step S**23**).

FIG. **5**A is a diagram showing an example of the output of the search result, given by the extract result outputter **213**. As shown in this figure, an output screen **261** for the pdf-format electronic manual stored in the operation manual information DB **220** presents the search result through a

search result list display area **263** located on the right side of a content display area **262**. More specifically, the search result list display area **263** displays, in the form of a list, indications of the pages containing a hit for the text, e.g., "10^x" as the output information from the electronic device **10**, together with a part of the respective explanatory sentence that contains the text. Here, the part of the explanatory sentence displayed in the list may distinctly show the hit text portion.

After the search result is displayed in the manner as discussed, the processor **21** may transition to an operation for jump designation that uses this output screen **261** for the electronic manual. The jump designation operation may follow the generally employed operations, so its detailed description will be omitted. The jump designation operation here is intended to be, for example, an operation in which a select action is performed on any of the search result displayed in the list as shown in FIG. **5**A with an arrow **264**, and thereby the corresponding page is displayed on the content display area **262** as shown in FIG. **5**B.

As described above, the first information corresponding to the first operation is output from the electronic device **10** to the information processing apparatus **20** in response to the predetermined trigger information input together with the first operation at the electronic device **10**. Accordingly, the information processing apparatus **20** can present the information related to the first operation in response to the first information. Consequently, the user is allowed to view the information related to key operations while continuing the normal operations, without the need of mode switching.

For example, in operating an electronic device with many keys such as a scientific electronic calculator, a user needs to refer to the manual until functions of the respective keys are made familiar. The user in this situation could conduct a text search on the pdf-format electronic operation manual downloaded to an information processing apparatus such as a tablet PC, quickly browse the whole of the resultant several to several tens of hits to spot the likely important portions, and read the portions. However, such a measure as conventionally employed requires the electronic device and the information processing apparatus to be both operated, and must proceed with the steps of inputting characters, etc. printed on the keytops and housing of the electronic device to the information processing apparatus for conducting the search; thus, it poses a burden on user operations.

According to the embodiment, with the connection between the electronic device **10** and the information processing apparatus **20** established, a user can readily refer to the applicable portions in the operation manual for the user's ongoing key operation, only by operating the electronic device **10** in a manner that is substantially in line with the normal operations. Only a slight change (e.g., applying a holding down, a tap, etc.) in the operation manner for the input of the trigger information enables switchover between normal operations and displaying the operation manual, and as such, the embodiment can improve usability (ease of making reference to operation manuals) without sacrificing user operability.

The foregoing embodiment has assumed the instances where the first information is information corresponding to a function, for example, text data "10^x" which can be used as a search key in text searches as it is.

Besides such information corresponding to a function, the first information may be the operation contents stored in the function/search key DB **160** as the information specifying the first operation, for example, information indicative of the combination of the [[SHIFT]] key and the [[log]] key. Or, the first information may be the display contents stored in the function/search key DB **160** as the information specifying a function, for example, "10^[ ]". If the first information is the information specifying the first operation or the information specifying a function, the information extractor **212** of the information processing apparatus **20** should convert the first information into the second information for use as a search key for searching the operation manual information DB **220**.

FIG. **6** is a flowchart schematically showing an exemplary operation performed by the information outputting system in such cases. The electronic device **10** operates in the same way as in the foregoing embodiment, but the output information generated by the search information generator **140** in step S**16** here is the information specifying the first operation, e.g., information indicative of the combination of the [[SHIFT]] key and the [[log]] key, or the information specifying a function, e.g., "10^[ ]".

Here, the processor **21** that runs the operation manual retrieval app **210** in the information processing apparatus **20** converts the received output information (first information) into the second information, for example, text data "10^x" serving as a search key for searching the operation manual information DB **220** (step S**24**). In order to enable this conversion, the information processing apparatus **20** may be, for example, provided with a database corresponding to the function/search key DB **160** in the electronic device **10**. Similar to the operation manual retrieval app **210** and the operation manual information DB **220** for example, this database may be downloaded by the communication unit **27** from the web server **40** via the network **30** and stored in the storage **24**.

The processor **21**, using this second information after the conversion as a search key, searches through the pdf-format electronic manual stored in the operation manual information DB **220** to acquire search results (step S**25**)

As such, the same advantages as in the foregoing embodiment can be realized in also the cases with the first information being the information specifying the first operation or the information specifying a function.

The first information for the foregoing embodiment has been described as the information for allowing the information processing apparatus **20** with the operation manual retrieval app **210** to perform text searches in the operation manual information DB **220**, but the first information may be of a different type of information. For example, the first information may be information for specifying locations in the pdf-format electronic operation manual stored in the operation manual information DB **220**, where the explanatory information for a corresponding user operation is given.

FIG. **7** is a diagram schematically showing an exemplary storage configuration of a function/search key DB in the information outputting system according to another embodiment of the present disclosure. As shown in this figure, the function/search key DB stores such specifying information in lieu of the search key (text) information as described for the exemplary storage configuration of FIG. **3**. The specifying information may contain a page number, a line number, and a character number (e.g., "P7L4C6-8") to directly specify the location in an operation manual. Also, the specifying information may contain a page number and an illustration number (e.g., "P15I2") to specify the location of a figure or an image that cannot be spotted by text searches.

With such specifying information employed as the first information, the information extractor **212** of the information processing apparatus **20** can use the first information as the second information so that a portion corresponding to the

second information is extracted from the operation manual information stored in the operation manual information DB **220**.

Electronic manuals as the operation manual information stored in the operation manual information DB **220** may be of a file format other than the pdf format. The electronic manuals here may contain tag information, and the first information may be information for specifying the tag information. As a matter of course, pdf-format electronic manuals may also contain such tag information if possible.

As such, the same advantages as in the foregoing embodiment can be realized in also the cases with the first information being the specifying information for specifying locations of the explanatory information for a user operation.

Note that the first information may be encrypted for transmission from the electronic device **10** to the information processing apparatus **20**. More specifically, the search information transmitter **150** of the electronic device **10** may have an information encrypting function, and the search information receiver **211** of the information processing apparatus **20** may have an information decrypting function. This configuration enhances the communication security.

Moreover, the first information may be provided from the electronic device **10** to the information processing apparatus **20** through a technique other than the communication technology. For example, the search information transmitter **150** of the electronic device **10** may encode given information to generate a QR-code image and cause the liquid-crystal display as the output unit **16** to display the QR-code image, and the search information receiver **211** of the information processing apparatus **20** may take the QR-code image using the camera as the input unit **25** and decode the QR-code image into the original information. It is also possible to adopt a technique of converting the first information into a sound (e.g., ultrasound) or vibrations (e.g., Morse code utilizing on/off vibrations) by the speaker or the vibrator as the output unit **16** of the electronic device **10**, and detecting the sound or the vibrations by the microphone as the input unit **25** of the information processing apparatus **20**. In this manner, the first information can be provided from the electronic device **10** to the information processing apparatus **20** through a technique other than the communication technology.

The foregoing embodiment has assumed that the operation manual information DB **220** is stored in the storage **24**, but the operation manual information DB **220** may be arranged on the web server **40**. In this case, the information extractor **212** of the information processing apparatus **20** may extract a portion corresponding to the second information via the network **30** by the communication unit **27**.

According to the present disclosure, the first information is generated by the search information generator **140** and then transmitted to the information processing apparatus **20** by the search information transmitter **150**, and the information processing apparatus **20** implements extraction and output of a portion of the operation manual information that corresponds to the second information. The disclosure intends no limitation by this. The electronic device **10** may take over at least part of the functions of the information processing apparatus **20**. For example, the processor (CPU **11**) of the electronic device **10** may perform the function of the information extractor **212**. With such a configuration, the electronic device **10**, using the processor (CPU **11**), extracts a portion corresponding to the second information (information corresponding to the first information) from the explanatory information about the electronic device **10**, stored in the storage **14** of the electronic device **10** or acquired via the network, instead of transmitting the first information to the information processing apparatus **20**. The electronic device **10** then transmits the extracted information to the information processing apparatus **20** by the search information transmitter **150**. Subsequently, the extracted information is displayed on the output unit **26**, such as a liquid-crystal display, in the information processing apparatus **20**. Moreover, the electronic device **10** may itself output the explanatory information extracted by the processor (CPU **11**) as, for example, a display presented through the liquid-crystal display, etc. of the electronic device **10**.

In the present disclosure, the information related to the first operation has been described as, by way of example, explanatory information appearing in an operation manual. However, the information related to the first operation is not limited to such explanatory information in an operation manual, and may be other types of information including, for example, explanatory information about formulas or knowledge associated with a function specified by the first operation.

Furthermore, the present disclosure is not limited to the foregoing embodiments. For practical implementation, various modifications may be adopted without departing from the gist of the disclosure. Also, the embodiments may be discretionarily combined for implementation, and such combinations will produce combined effects. Still more, the foregoing embodiments involve various inventive aspects, and appropriate combinations of the features disclosed herein shall permit various inventions to be derived. For example, one or more of the features discussed for a certain embodiment may be omitted, and provided that such modification can solve the intended problem and bring the intended effects, the modification should be deemed an invention.

Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details and representative embodiments shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalents.

What is claimed is:

1. An electronic device comprising:

an input device configured to receive a key operation as a first operation;

an acceleration sensor configured to detect a tilt of the electronic device as a predetermined trigger operation; and

a processor configured to:

in response to an input of the first operation without input of the predetermined trigger operation, specify a function to perform according to the key operation and perform the function;

in response to an input of the predetermined trigger operation via the acceleration sensor in conjunction with the first operation, generate first information corresponding to the function, wherein the first information is in the form of text data for use in searches for information regarding the performance of the function; and

send the first information to an external information processing apparatus to cause the external information processing apparatus to control a display to display the information regarding the performance of the function.

2. The electronic device according to claim 1,
wherein the processor is configured to extract, based on second information corresponding to the first information, the information regarding the performance of the function, stored in a memory of the electronic device or acquired via a network.

3. The electronic device according to claim 2,
wherein the processor is configured to:
determine whether or not the predetermined trigger operation is input via the acceleration sensor in conjunction with the first operation; and
in response to determining that the predetermined trigger operation is input via the acceleration sensor in conjunction with receiving the input of the first operation, generate the first information corresponding to the function.

4. The electronic device according to claim 1,
wherein the text data for use in searches for information regarding the performance of the function specifies one or more locations in a stored file in which the information regarding the performance of the function is given.

5. The electronic device according to claim 1,
wherein the processor is configured to:
determine whether or not the predetermined trigger operation is input via the acceleration sensor in conjunction with the first operation; and
in response to determining that the predetermined trigger operation is input via the acceleration sensor in conjunction with receiving the input of the first operation, generate the first information corresponding to the function.

6. The electronic device according to claim 1, further comprising a communication device configured to output the first information so that the first information is received by the external information processing apparatus that is provided with the information regarding the performance of the function.

7. The electronic device according to claim 1, further comprising a display device configured to display information,
wherein the processor is configured to encode the first information to generate a QR-code image, and cause the display device to display the QR-code image.

8. The electronic device according to claim 1, further comprising a communication device configured to communicate with an external entity,
wherein the processor is configured to encrypt the first information to generate an encrypted first information, and cause the communication device to output the encrypted first information to the external entity.

9. A method implemented in an electronic device, the electronic device comprising an input device configured to receive a key operation as a first operation, an acceleration sensor configured to detect a tilt of the electronic device as a predetermined trigger operation and a processor, the method comprising:
receiving, by the input device, an input of the first operation specifying a function to perform;
in response to the input of the first operation without input of the predetermined trigger operation, specifying the function to perform according to the key operation and performing, by the processor, the function;
inputting, via the acceleration sensor, the predetermined trigger operation in conjunction with the input of the first operation specifying the function;
in response to the inputting of the predetermined trigger operation via the acceleration sensor in conjunction with receiving the input of the first operation, generating, by the processor, first information corresponding to the function, wherein the first information is in the form of text data for use in searches for information regarding the performance of the function; and
sending the first information to an external information processing apparatus to cause the external information processing apparatus to control a display to display the information regarding the performance of the function.

10. The method according to claim 9, further comprising extracting, by the processor and based on second information corresponding to the first information, the information regarding the performance of the function, stored in a memory of the electronic device or acquired via a network.

11. The method according to claim 9,
wherein the text data for use in searches for information regarding the performance of the function specifies one or more locations in a stored file in which the information regarding the performance of the function is given.

12. The method according to claim 9,
wherein the generating the first information comprises:
determining, by the processor, that the predetermined trigger operation is input via the acceleration sensor in conjunction with the first operation; and
in response to determining that the predetermined trigger operation is input via the acceleration sensor in conjunction with receiving the input of the first operation, generating, by the processor, the first information corresponding to the function.

13. A method implemented in an information outputting system, the information outputting system comprising an electronic device and an information processing apparatus configured to communicate with the electronic device, the electronic device comprising an input device configured to receive a key operation as a first operation, an acceleration sensor configured to detect a tilt of the electronic device as a predetermined trigger operation and a processor, the method comprising:
receiving, by the input device, an input of the first operation specifying a function to perform;
in response to the input of the first operation without input of the predetermined trigger operation, specifying the function to perform according to the key operation and performing, by the processor of the electronic device, the function;
inputting, via the acceleration sensor of the electronic device, the predetermined trigger operation in conjunction with the input of the first operation specifying the function;
in response to the inputting of the predetermined trigger operation via the acceleration sensor in conjunction with receiving the input of the first operation, generating and outputting, by the processor of the electronic device, first information corresponding to the function, wherein the first information is in the form of text data for use in searches for information regarding the performance of the function;
acquiring, by the information processing apparatus, the first information;
extracting, by the information processing apparatus and based on second information corresponding to the first information, the information regarding the perfor-

mance of the function, stored in a memory of the information processing apparatus or acquired via a network; and

controlling, by the information processing apparatus, a display to display the information regarding the performance of the function.

14. The method according to claim **13**,

wherein the extracting the information regarding the performance of the function comprises searching, by the information processing apparatus, for the information regarding the performance of the function with the text data as a key.

15. The method according to claim **13**,

wherein the text data for use in searches for information regarding the performance of the function specifies one or more locations in a stored file in which the information regarding the performance of the function is given.

16. The method according to claim **13**,

wherein the generating the first information comprises:

determining, by the processor of the electronic device, that the predetermined trigger operation is input via the acceleration sensor in conjunction with the first operation; and

in response to determining that the predetermined trigger operation is input via the acceleration sensor in conjunction with receiving the input of the first operation, generating, by the processor, the first information corresponding to the function.

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